Listing of Claims

1. (previously presented) A method for gap filling between metal-metal lines, comprising:

providing a semiconductor structure, a surface of said semiconductor structure has a plurality of metal lines thereon;

forming a first dielectric layer on a surface and a side wall of said plurality of metal lines by a first high density plasma;

removing said first dielectric layer until a portion of said side wall of said plurality of metal lines are exposed by a second high density plasma , wherein a portion of said first dielectric layer with a geometric shape is on some of said metal lines; and

forming a second dielectric layer on said first dielectric layer by a third high density plasma to fill gaps between said metal lines and cover said plurality of metal lines and said portion of said first dielectric layer with said geometric shape thereon to form an inter-metal dielectric layer wherein all of said steps are performed in situ in a chamber.

2. (Original) The method according to claim 1, further comprising an adhesive layer formed on said underside of said plurality of metal lines.

3. (Original) The method according to claim 2, further comprising an anti-reflection layer formed on top of said plurality of metal lines.

4. (Original) The method according to claim 3, wherein the material of said anti-reflection layer is silicon-oxy-nitride (SiO_xN_y).

5. (Original) The method according to claim 1, wherein the material of said plurality of metal lines is selected from the group consisting of AlCu alloy and Al alloy.

6. (Original) The method according to claim 1, wherein the material of said first dielectric layer is silicon dioxide.

7. (Original) The method according to claim 1, wherein the material of said second dielectric layer is silicon dioxide.

8. (Original) The method according to claim 1, wherein said first high density plasma is formed by a first mixed gas with both low frequency radio frequency power and high frequency radio frequency power with a bias voltage on an electrostatic chuck (ESC).

9. (Original) The method according to claim 8, wherein said first mixed gas comprises a first depositing gas, a first inert gas and oxygen.

10. (Original) The method according to claim 9, wherein said first depositing gas is silane (SiH_4).

11. (Original) The method according to claim 9, wherein said first inert gas is argon.

12. (Original) The method according to claim 1, wherein said second high density plasma is formed by a second mixed gas with both low frequency radio frequency power and high frequency radio frequency power with a bias voltage on an electrostatic chuck (ESC).

13. (Original) The method according to claim 12, wherein said second mixed gas comprises a second inert gas and oxygen.

14. (Original) The method according to claim 13, wherein said second inert gas is argon.

15. (Original) The method according to claim 1, wherein said third high density plasma is formed by a third mixed gas with both low frequency radio frequency power and high frequency radio frequency power with a bias voltage on an electrostatic chuck (ESC).

16. (Original) The method according to claim 15, wherein said third mixed gas comprises a second depositing gas, a third inert gas and oxygen.

17. (Original) The method according to claim 16, wherein said second depositing gas is silane.

18. (Original) The method according to claim 16, wherein said third inert gas is argon.

19. (Canceled).

20. (previously presented) A method for gap filling between metal-metal lines, comprising:

providing a semiconductor structure in a chamber, wherein a surface of said semiconductor structure has a plurality of metal lines thereon;

providing a first mixed gas in said chamber, wherein said first mixed gas comprises a first inert gas, a first depositing gas and a first oxidative gas;

producing a first high density plasma from said first mixed gas to form a first dielectric layer on a surface and a side wall of said plurality of metal lines;

providing a second mixed gas in said chamber, wherein said second mixed gas comprises a second inert gas and a second oxidative gas;

producing a second high density plasma from said second mixed gas to remove a portion of said first dielectric layer and a portion of said first dielectric layer with a geometric shape remains on some of said metal lines;

providing a third mixed gas in said chamber, wherein said third mixed gas

comprises a third inert gas, a second depositing as and a third oxidative gas; and

producing a third high density plasma from said third mixed gas to form a second dielectric layer on said first dielectric layer to fill gaps between said metal lines and cover said metal lines and said portion of said first dielectric layer with said geometric shape thereon to form an inter-metal dielectric layer wherein all of said steps are performed in situ in a chamber.

21. (Original) The method according to claim 20, further comprising an adhesive layer formed on said underside of said plurality of metal lines.

22. (Original) The method according to claim 20, further comprising an anti-reflection layer formed on said top of said plurality of metal lines.

23. (Original) The method according to claim 22, wherein the material of said anti-reflection layer is silicon-oxy-nitride (SiO_xN_y).

24. (Original) The method according to claim 20, wherein said material of said plurality of metal lines is selected from the group consisting of AlCu alloy and Al alloy.

25. (Original) The method according to claim 20, wherein the material of said first dielectric layer is silicon dioxide.

26. (Original) The method according to claim 20, wherein the material of said second dielectric layer is silicon dioxide.

27. (Canceled).